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COMPETITION INTENSITY IN CANADA: A CRITIQUE OF RECENT OECD FINDINGS

Stéphane Crépeau and Marc Duhamel,
Industry Canada

Working Paper 2008-09

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Abstract

In a series of recent publications, the Organisation for Economic Co-operation and Development (OECD) used the Hirschman-Herfindahl Index (HHI), in conjunction with other indicators of market power (import penetration rates and relative mark-ups) often used in the economics literature, to evaluate the market structure of industries and examine the intensity of competition in several countries, including Canada. In this paper, we find that the OECD substantially overestimated the intensity of competition in Canadian industries by systematically underestimating Canada's HHI by more than 450 times in some industries. Contrary to the OECD findings, we show that the average HHI of Canadian industries was 115% higher than for U.S. industries rather than 40% lower. For reasons outlined in the paper - computation errors, systematic bias of the OECD's HHI indicator, and the use of establishment-level data - the international comparisons of HHI performed by the OECD should be dismissed and their conclusions regarding the intensity of competition in Canadian industries should be considered with great caution.

Key words: competition intensity, measures of competition intensity, market power indicators

Résumé

Dans une récente série de documents, l'Organisation de coopération et de développement économiques (OCDE) a utilisé l'Indice Hirschman-Herfindahl (IHH), conjointement avec d'autres mesures du pouvoir exercé sur le marché (le taux de pénétration des importations et la marge commerciale relative) fréquemment utilisées, pour évaluer la structure de marché des industries et l'intensité de la concurrence dans plusieurs pays, dont le Canada. Dans l'étude, nous constatons que l'OCDE a grandement surévalué l'intensité de la concurrence dans les industries canadiennes. En effet, la valeur de l'IHH de certaines industries canadiennes est au moins 450 fois supérieure à celle estimée par l'OCDE. Contrairement aux conclusions de l'OCDE, l'étude nous montre que l'IHH moyen des industries canadiennes est 115 p. 100 supérieur à celui des industries américaines, plutôt que 40 p. 100 inférieur. En raison de divers facteurs détaillés dans le document (erreurs de calcul, biais systématique des mesures d'IHH de l'OCDE et utilisation des données à l'échelle des établissements), les comparaisons internationales effectuées par l'OCDE devraient être rejetées et les conclusions quant à l'intensité de la concurrence dans les industries canadiennes qui en sont tirées devraient être considérées avec la plus grande prudence.

Mots clés : l'intensité de la concurrence, mesures de l'intensité de la concurrence, mesures du pouvoir exercé sur le marché

1. Introduction

On the basis of several recent publications, the OECD argues that, in general, competitive forces appear to be relatively strong in Canada (in particular, see the OECD *Economic Survey of Canada, 2004*).

While some glaring exceptions exist in important network service industries such as electricity, telecommunications and airlines (OECD, 2006 para. 2.1 at p. 53), this finding is of significant importance for economic policy in Canada. Indeed, the academic literature has found that vigorous competition in product markets is often a key driver of productivity growth (e.g. Syverson, 2004 and Schmitz, 2005). Yet, these findings are also puzzling given that a lack of competitive intensity in Canada is often cited as a factor contributing to the productivity gap between Canada and the U.S. (e.g. CBOC, 2004 at p. 9).

The OECD's analysis relies on a number of imperfect proxy measures of competition such as structural concentration measures, import penetration rates, and relative mark-ups of industries across countries. While exposure to trade has been found to effect industry productivity and innovation (e.g. Bernard and Jensen, 1999, Melitz 2003, and Klette and Kortum, 2004), there is no empirical evidence that import penetration rates reduce the market power of firms operating in Canada (i.e. Thompson, 2002). And while significant mark-ups have been estimated in macroeconomic studies (in particular, see Hall, 1988, and Roeger, 1995) and shown to be pro-cyclical (e.g. Haskel et al., 1996, and Martins et al. 1996a), micro-level studies have criticized their use and reliability to measure competition intensity because low mark-ups can reflect lower competition intensity and higher costs, and do not appropriately measure economic profits (e.g. Schmalensee, 1988 and Thille, 2004).

A significant element of the OECD analysis relies on a comparison of the Hirschman-Herfindahl Index (HHI) of International Standard Industrial Classification (ISIC) manufacturing industries across several countries.[1] In the industrial economics literature, the HHI is often considered a reliable measure of competitive intensity for theoretical and empirical applications, when taking into account barriers to entry (e.g. see Tirole, 1988 pp.221–223 and Church and Ware, 2000 pp.238–240). In this short note, we review the methodology and findings of Gjersem (2002), Maher and Wise (2005), and substantially reproduced in OECD (2004). We focus our discussion on their analysis of the HHI.[2]

In these papers, the OECD shows that the average and median HHI for Canadian industries to be well below those of other countries, including the U.S., Japan, U.K., Finland, Sweden and Belgium. In other words, according to the HHI figures reported, competition appears relatively more intense in Canadian industries than in other OECD countries.

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[1] The results of Gjersem (2002), Maher and Wise (2005) and OECD (2004) are reproduced in the non-shaded area of Table 1 (see Annex).

[2] More recent applications have focussed on the firm-level residual elasticity of demand between products to measure competition intensity and market power (among others, see Berry, Levinsohn and Pakes, 2004).

However, we find that a computation error underlying the HHI figures reported in these papers under-estimate by more than 120 times the concentration of some Canadian manufacturing industries compared to our calculations performed on a unique data set obtained from Statistics Canada (SC) (see shaded area of Table 1, Annex). We also detail two other factors that further add to the discrepancy between the OECD figures and our calculations. They are: the proxy used by the OECD that systematically underestimates the standard measure of HHI, and the use of establishment-level data instead of enterprise-level data as the basis for the Canadian, U.S. and Japanese OECD calculations. These latter two factors raise the discrepancy to more than 450 times in the case of tobacco product manufacturing (ISIC 16).[3]

The next section provides an overview of the definition and economic rationales for HHI. Section 3 reviews the three main problems underlying the OECD's computation and analysis of HHI. Section 4 discusses three important pitfalls that need to be taken into account in order to properly interpret and benchmark HHI across countries in terms of competition intensity. We then conclude that these issues raise significant concerns over the reliability of the OECD's international benchmarking of structural measures of concentration, and that their findings over relative competition intensity should be dismissed.

2. A Structural Measure of Competition Intensity

The HHI is a structural measure of market concentration often used in the industrial economics literature to estimate market structure and competition intensity in a particular market (generally described as a set of products or services available in a geographic area in a given time period where no close substitutes would be available at a comparable price).[4]

With N firms selling relatively close substitute in a given market, the HHI is defined as:

$$(1) \qquad HHI = \sum_{i=1}^{N} \left[\frac{X_i}{\sum_i X_i} \right]^2 \cdot 10{,}000$$

where X_i is an appropriately defined measure of firm i's production (e.g. unit sales, revenues, production capacity) for $i = 1, 2, ..., N$. In other words, the HHI is the sum of squared market-share of all firms in a market, usually scaled by a factor of 10,000.

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[3] The HHI(SHIP) for *Manufacture of Tobacco Products* (ISIC D1600) in Table 3 (Annex) is 4824.0 compared to the OECD reported 10.6 (ISIC 16) in Table 1 (Annex).

[4] For general discussions, see Thille (2004) and Schmalensee (1988).

The HHI is considered a more reliable measure of competitive intensity than other structural measures of market structure such as concentration ratios (calculated as the total market share of a given number of top leading firms) for theoretical and empirical applications.[5]

Observe that the HHI values range from 0 when there are numerous infinitesimally small firms (i.e. perfect competition) to 10,000 when a single firm supplies the entire market (i.e. monopoly). As less firms are responsible for an increasing amount of the market's supply, the HHI increases monotonically from 0 to 10,000. A simple example illustrates this point:

EXAMPLE 1

Market	Total Market Sales ($)	Firm 1 Market Share	Firm 2 Market Share	Firm 3 Market Share	Firm 4 Market Share	Firm 5 Market Share	HHI
A	100	0.1	0.1	0.1	0.35	0.35	2750
B	500	0.05	0.05	0.1	0.1	0.7	5150
C	1000	0.05	0.05	0.3	0.3	0.3	2750
D	200	0.3	0.3	0.4	-	-	3400

Note: a hyphen (-) denotes an observation where no firm is producing.

The *Federal Trade Commission* and the Antitrust Division of the *Department of Justice* in the U.S. generally consider that there are no *a priori* significant competition issues in a merger between two firms if the HHI falls below 1000 in a well defined relevant market (often significantly smaller than those established by NAICS or ISIC industrial classification systems). In Canada, the HHI of a market considered potentially dominated by a single firm with 65% market share by antitrust authorities would fall above 4225 although no such formal thresholds are currently enforced by the Competition Bureau.

3. Three Issues with the OECD's Findings

Statistics Canada produces yearly HHI at the national and provincial levels for Canada using shipments, value added, and the number of employees of enterprises (i.e. taking into consideration multi-establishment firms) by NAICS manufacturing industries. Statistics Canada also produces HHI figures using the ISIC rev.3 at the four digit level for Canada (see Table 3, Annex).

Notwithstanding the availability of this data, there are three core problems with the OECD's calculation of the HHI for international benchmarking purposes.

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[5] In particular, see Tirole (1988, pp.221–223) and Church and Ware (2000, pp.238–240).

3.1 Computation Errors

First, replicating their analysis with raw data for Canada provided by the OECD Secretariat uncovered a simple computation error that results in major errors in the Canadian HHI figures (except for the food & beverage industry, ISIC D15). This error underestimates the HHI by more than 120 times in some industries (see shaded area in Table 1, Annex).[6] The correction and re-calculations of the OECD HHI figures moves Canada from first to fourth (out of 10) in terms of a country's average HHI, behind the U.S., Japan and the U.K.

3.2 Systematic Bias of Proxy

Second, the OECD relied on an empirical proxy of the HHI that systematically underestimates the standard measure.

When firm-level market-share data is not available, alternative measures can sometimes be computed to proxy the HHI. Because detailed firm-level market-share data was not available for most countries, the OECD used the following proxy:

$$HHI_{OECD} = \sum_{k=1}^{M} n_k \left[\frac{X_k / n_k}{\sum_k X_k} \right]^2 \cdot 10{,}000 \qquad (2)$$

where firms are grouped into categories $k = 1, \ldots, M$ (e.g. by firm-size employment categories, by sub-industries, or by market segments), and X_k is the total output of firms in category k and n_k is the total number of firms in category k such that X_k / n_k is the average output of firms in category $k = 1, \ldots, M$. The HHI-OECD values also range from 0 when there are numerous infinitesimally small firms to 10 000 when a single firm exists in the industry. Note that because (X_i/n_i) is the average output of all firms in category i, market share symmetry is assumed within each category.

Schmalensee (1977) shows that the proxy used by the OECD gives a minimum bound for the HHI. Since the proxy used by the OECD relies on the size distributions of establishments to approximate the HHI, it gives a lower bound to the standard HHI. The extent of the systematic bias depends on how much the firm's market share in a category differs from the average category market share.[7]

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[6] The data used by the OECD was provided by SC and subsequently obtained by IC. Note that we were able to replicate the OECD's results.

[7] We were not able to estimate the extent of the bias with the publicly available information.

Using the previous example and assuming that firms 1 and 2 correspond to category k=1 (e.g. firms with less than 100 employees) and firms 3, 4, and 5 correspond to category k=2 (e.g. firms with more than 100 employees), we can see that the HHI-OECD underestimates the HHI except in situations where all firms in a category have the same market share.

Example 2

Market	Total Market Sales ($)	Category 1 Market Share	Category 2 Market Share	HHI-OECD	HHI
A	100	0.2	0.8	2333	2750
B	500	0.1	0.9	2750	5150
C	1000	0.1	0.9	2750	2750
D	200	0.6	0.4	3400	3400

In particular, since each firm's market share is equal in each category in markets C and D, the HHI-OECD equals the HHI in markets C and D but not in markets A and B.

3.3 Controlling for the Ownership of Establishments

Third, the OECD uses establishment-level value-added (VA) share data in its calculations instead of enterprise-based data. Since a single firm (enterprise) may comprise one or more establishments that engage in the same activity, the OECD introduces another systematic downward bias to the Canadian HHI.

In 2001, there were about 4000 (or 8%) more manufacturing establishments than firms in Canada (see Table 3, Annex). Although the HHI calculations for Canada, the U.S. and Japan are also based on establishment data, the HHI for all other countries are based on enterprise-level data. This makes the benchmarking of HHI between countries in Table 1 (Annex) hazardous.

First, it underestimates the HHI value for industries in Canada, the U.S. and Japan against all other countries. Second, it is also difficult to compare industry HHI figures between Canada, the U.S. and Japan because the ownership of establishments in an industry could be distributed differently between these countries.

3.4 Overall Discrepancy

These last two aspects underlying the OECD calculations (see 3.2 and 3.3 above) not only explain a substantial and systematic downward bias of more than 752 points on average (or

191%) between the HHI of Canadian industries reported by the OECD and those calculated directly with SC data (see Table 3, Annex), but the difference is huge in some industries (e.g. a minimum gap of 3,400 points for the Canadian tobacco products manufacturing industry, ISIC 16).

In terms of the existing economic literature on HHI, such 1000-3000 points downward bias significantly over-estimates the intensity of competition.

4. Three Pitfalls of HHI Estimation and Benchmarking

At least three important considerations need to be taken into account in order to properly estimate, benchmark, and interpret HHI in terms of competition intensity.

First, a factor that affects significantly HHI values is the industrial classification system (e.g. NAICS, ISIC). Figures 1a and 1b (Annex) show that the NAICS and ISIC distributions of industry HHI are markedly different, with the ISIC distribution of industry HHI showing an higher average, median, and maximum than NAICS. On average, the four-digit NAICS-based HHI underestimates the Canadian ISIC-based HHI by 40% (see Figures 1a and 1b, Annex). Unfortunately, direct conversions between NAICS and ISIC is impossible because an industry in one classification system can link to multiple sectors in the other. Although the ISIC classification could be a better approach conceptually (because it is a product- rather production process-based classification system), both systems have been criticized for providing artificial and arbitrary boundaries of markets that do not take into account the effective competition between substitute products and services.[8]

Second, HHI should be computed using production rather than value-added data of enterprise activities according to the industrial economics literature. As the last two columns of Table 3 (Annex) show, HHI computed using value-added share of a firm's production can over- or under-estimate the concentration of an industry although both measures are very closely correlated (the coefficient of correlation is 0.97).

Cross-Correlation Between Concentration Indicators

	HHI-OECD (VA)	HHI (VA)	HHI (SHIP)
HHI-OECD	1	0.86014	0.839664
HHI (VA)	0.86014	1	0.973819
HHI (SHIP)	0.839664	0.973819	1

Third, the structural approach to competition intensity (e.g. with HHI) has been known to be quite unreliable to measure the competitive intensity of an industry on empirical and theoretical

[8] For example, see Werden (1988), Pittman and Werden (1990), and Thille (2004, 2006).

grounds. For example, competitive intensity can be very vigorous when a single firm faces strong potential rivalry (i.e. in perfectly contestable markets) or very weak when large production cost differentials exist between a dominant firm and numerous fringe producers in a market.

In order to deal with such issues, some industrial economists have proposed different theoretical and empirical approaches that specifically seek to explain the intensity of competition and have developed new measures of competitive intensity that better reflect theoretical and empirical developments (e.g. Sutton, 1991). However, such considerations are outside the scope of the present note.

5. CONCLUSION

For these reasons, the international comparisons of HHI performed by the OECD should be dismissed and their conclusions regarding the intensity of competition in Canadian industries should be considered with great caution.

A more careful comparison of HHI between Canadian and U.S. industries is provided in Table 2 (Annex) on the basis of NAICS industries. It shows Canadian manufacturing industries more concentrated on average than U.S. industries by 110 points in 1997 (last year available for the U.S.). In addition, industrial concentration increased in Canada between 1997 and 2001.

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Annex

Table 1. Hirschman-Herfindahl indices of industry concentration

(Using the International Standard Industrial Classification of All Economic Activities (ISIC) Revision 3)

ISIC Rev.3 code		Aut[1] 1997	Bel[1] 1997	Fin[1] 1997	Ita[2] 1999	Swe[1] 1999	UK[1,2] 2000	Jpn[1,3] 1999	Fra[2] 1999	US[1,3] 1997	Can[3] 2001	Can* 2001	% diff. Can** 2001
Division D	**MANUFACTURING**												
15	Food and beverages	-	-	-	11.7	-	27.2	1.5	14.9	3.3	10	**10.0**	0
16	Tobacco products	-	1956.9	-	2334.5	-	-	386.4	-	-	10.6	**1374.8**	12,870.0
17	Textiles	87.8	54.4	442.9	8.2	124.9	19.4	3.3	20.5	6.5	-	**31.9**	-
18	Wearing apparel	130.5	492.7	341.4	18.1	244	29	4	23.8	8.9	-	**20.5**	-
19	Leather and footwear	-	-	-	11.2	-	134	45.6	58	65.1	-	**173.5**	-
20	Wood products	57.5	86.9	166.7	3.4	76.1	15.6	5	14.3	3.7	4.4	**12.2**	177
21	Paper and pulp products	160.3	185	352	76.9	218.3	78.8	23	63.2	14.4	30.5	**40.4**	32
22	Publishing and printing	49.1	39.6	98.5	46.6	38.7	14.1	17.9	15.4	3	2.8	**18.0**	541
23	Coke and petroleum products	-	1082.6	-	830.4	917.2	-	236.9	753.1	76.4	29.7	**475.5**	1501
24	Chemical products	206.8	75	284.4	38.6	375.3	43.5	14.9	30	14.4	29.7	**34.3**	15
25	Plastic and rubber products	-	-	-	24.5	-	21.7	6.8	48.1	5	4.1	**18.3**	346
26	Non-metallic products	51	80.7	216.8	25.6	175.4	44.4	8.8	59.6	6.6	3.6	**28.4**	690
27	Basic metals	170.2	298.6	739.4	60.1	352.4	111.6	46.4	114.7	29	30.7	**67.2**	119
28	Fabricated metal products	23	23.8	59.2	1.6	24.4	8.6	9.9	9	1.6	6.5	**7.9**	22
29	Machinery and equipment	43.4	96.4	98.4	8.9	69.5	16.9	7.5	22.1	7.5	5.4	**13.2**	145
30	Office and computing machinery	792.4	387.4	-	710.6	367.3	284.8	84.2	1292.5	17.9	1.8	**208.8**	11502
31	Electrical machinery	92.1	208.6	322.9	23.3	129.2	31	21.6	97.2	13.9	3.5	**45.6**	1204
32	Radio, TV and communication equipment	518.3	926.9	576.3	106.8	618.9	133.6	18.6	226.5	-	3.4	**86.3**	2438
33	Medical appliances, optical instruments, watches and clocks	-	76	269.2	24	321.4	42.9	47.7	48.5	-	1.8	**57.7**	3104
34	Motor vehicles	475.6	362.8	429.3	148.2	446.2	89.7	49.4	139.9	23.9	40.7	**43.1**	6
35	Other transport equipment	553.2	903.2	753.3	289.8	662.9	116.6	109.2	339.2	-	13	**113.1**	770
36	Furniture and other manufacturing	-	-	-	5.6	-	13.1	34.2	52.1	11.1	1.6	**17.5**	996
	Mean	227.4	407.6	343.4	218.6	303.7	63.8	53.8	163.9	17.3	12.3	**131.7**	1919.9
	Median	130.5	196.8	322.9	25.1	244	37	20.1	52.1	10	5.4	**37.4**	541
	Maximum	792.4	1956.9	753.3	2334.5	917.2	284.8	386.4	1292.5	76.4	40.7	**1374.8**	12870
	Minimum	23	23.8	59.2	1.6	24.4	8.6	1.5	9	1.6	1.6	**7.9**	0
	Std. Dev.	238.2	509.7	216.1	522.2	247.7	67.2	90.8	308.5	20.9	12.8	**296.5**	3724.7
	n	15	18	15	22	17	20	22	21	18	19	**22**	19

Note:

*IC calculations using the OECD methodology without the calculation error found in the OECD (2004) version

**Percentage difference between HHI values with and without the OECD calculation error for Canada

HHI for Canada, the US and Japan are based on establishment data

All other countries are based on enterprise data

Source:

1. ECO/WKP (No. 378) OECD (2002)
2. ECO/WKP (No. 433) OECD (2005)
3. OECD (2004)

Table 2. Hirschman-Herfindahl indices of industry concentration

(Using the North American Industry Classification System (NAICS))

NAICS code	MANUFACTURING	Can[1] 1997	Can[1] 2001	US[2] 1997	% Diff. Can 1997 and US 1997	% Diff. Can 1997 and Can 2001
311	Food manufacturing	87.4	117.4	87	0.5	34.3
312	Beverage and Tobacco manufacturing	1065.3	1233.2	1166.4	(8.7)	15.8
313	Textile mills	155.3	146.8	69.6	123.1	(5.5)
314	Textile product mills	267.1	399.3	145.9	83.1	49.5
315	Clothing manufacturing	82.8	42.3	104.4	(20.7)	(48.9)
316	Leather and allied product manufacturing	329.6	342.6	186.9	76.4	3.9
321	Wood product manufacturing	83.3	100.6	47.8	74.3	20.8
322	Paper manufacturing	170.8	384.8	196.6	(13.1)	125.3
323	Printing and related support activities	144.8	157.2	35.1	312.5	8.6
324	Petroleum and coal products manufacturing	966.2	1185.7	438.9	120.1	22.7
325	Chemical manufacturing	164.4	130	94.7	73.6	(20.9)
326	Plastics and rubber products manufacturing	81.4	67.8	31.3	160.1	(16.7)
327	Non-metallic mineral product manufacturing	269.7	203.9	65.4	312.4	(24.4)
331	Primary metal manufacturing	458.9	532.5	107.7	326.1	16.0
332	Fabricated metal product manufacturing	28.6	30.7	6.8	320.6	7.3
333	Machinery manufacturing	55.9	67.3	49	14.1	20.4
334	Computer and electronic product manufacturing	658.2	182.2	170.7	285.6	(72.3)
335	Electrical equipment, appliance and component	167.8	305.4	114.2	46.9	82.0
336	Transportation equipment manufacturing	847.7	1049.6	708.7	19.6	23.8
337	Furniture and related product manufacturing	77.3	56.7	67.7	14.2	(26.6)
339	Miscellaneous manufacturing	90.5	64.4	47.2	91.7	(28.8)
	Mean	297.8	323.8	187.7	114.9	8.9
	Median	164.4	157.2	94.7	76.4	8.6
	Maximum	1065.3	1233.2	1166.4	326.1	125.3
	Minimum	28.6	30.7	6.8	(20.7)	(72.3)
	Std. Dev	316	374.8	275.2	122.4	43.3
	n	21	21	21	21	21

Note:

HHI based on value-added, firm level data

Source:

1. Statistics Canada
2. US Census Bureau

Table 3. Hirschman-Herfindahl indices of industry concentration for Canada in 2001
(Using the International Standard Industrial Classification of All Economic Activities (ISIC) Revision 3)

ISIC-REV 3	Manufacturing Industry	ESTABL. #	ENTERP. #	HHI-OECD (VA)	HHI (VA)	HHI (SHIP.)
D1511	Production, processing and preserving of meat and meat products	769	674	50.4	442.2	458.1
D1512	Processing and preserving of fish and fish	700	645	36.9	153.7	140.3
D1513	Processing and preserving of fruit and vegetables	372	335	164.0	617.1	491.9
D1514	Manufacture of vegetable and animal oils and fats	39	26	972.8	2577.6	2814.3
D1520	Manufacture of dairy products	434	325	101.6	1128.3	1252.2
D1531	Manufacture of grain and mill products	205	177	313.1	961.9	698.6
D1532	Manufacture of starches and starch products	10	8	2368.2	6651.3	6274.8
D1533	Manufacture of prepared animal feeds	562	437	41.7	228.1	281.3
D1541	Manufacture of bakery products	1616	1532	64.6	471.3	400.7
D1542	Manufacture of sugar	13	11	1945.7	3048.6	3320.7
D1543	Manufacture of cocoa, chocolate and sugar confectionery	176	164	397.9	1181.0	949.8
D1544	Manufacture of macaroni, noodles, couscous and similar farinaceous products	86	85	1197.9	2382.0	2072.9
D1549	Manufacture of other products n.e.c.	563	527	132.7	1039.3	513.7
D1551	Distilling, rectifying and blending of spirits; ethyl alcohol production from fermented materials	18	14	1273.8	3387.5	3091.4
D1552	Manufacture of wines	168	155	553.2	2354.7	1958.7
D1553	Manufacture of malt liquors and malt	130	113	526.3	4030.3	3955.8
D1554	Manufacture of soft drinks; production of mineral waters	174	140	273.7	2453.5	2860.1
D1600	Manufacture of tobacco products	23	18	1374.8	5171.6	4824.0
D1711	Preparation and spinning of textile fibres; weaving of textiles	173	156	170.1	327.0	276.7
D1712	Finishing of textiles	243	242	296.6	424.0	471.2
D1721	Manufacture of made-up textile articles, except apparel	612	589	105.0	196.3	188.6
D1722	Manufacture of carpets and rugs	48	41	734.6	2613.0	1935.1
D1723	Manufacture of cordage, rope, twine and netting	359	357	117.7	198.3	334.2
D1729	Manufacture of other textiles n.e.c.	115	109	270.2	436.0	512.3
D1730	Manufacture of knitted and crocheted fabrics and articles	307	293	145.5	258.9	230.1
D1810	Manufacture of wearing apparel, except fur	2437	2396	21.6	48.1	45.2
D1820	Dressing and dyeing of fur; manufacture of articles of fur	194	193	292.9	294.9	343.2
D1911	Tanning and dressing of leather	95	94	250.2	448.4	1062.8
D1912	Manufacture of luggage, handbags and the like, saddlery and harness	151	151	192.7	237.1	320.4
D1920	Manufacture of footwear	110	107	390.3	698.8	641.5
D2010	Sawmilling and planing of wood	1906	1690	19.8	149.8	163.1
D2021	Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board and other panels and boards	196	150	104.7	346.4	354.1
D2022	Manufacture of builders' carpentry and joinery	876	835	62.6	194.9	189.2
D2023	Manufacture of wooden containers	352	320	59.4	129.9	116.6

Table 3 (cont.)

ISIC-REV 3	Manufacturing Industry	ESTABL. #	ENTERP. #	HHI-OECD (VA)	HHI (VA)	HHI (SHIP.)
D2029	Manufacture of articles of cork, straw and plaiting materials	395	389	128.4	220.8	261.0
D2101	Manufacture of pulp, paper and paperboard	208	122	80.7	604.5	494.5
D2102	Manufacture of corrugated paper and paperboard and containers of paper and paperboard	475	381	59.2	327.1	341.8
D2109	Manufacture of other articles of paper and paperboard	167	131	242.6	769.5	711.2
D2221	Printing	4162	3889	20.7	185.0	283.5
D2222	Service activities related to printing	626	620	65.1	131.4	113.3
D2230	Reproduction of recorded media	131	128	821.1	1579.3	1221.0
D2320	Manufacture of refined petroleum products	84	68	475.5	1474.0	1542.7
D2411	Manufacture of basic chemicals, except fertilizers and nitrogen compounds	328	205	124.7	544.1	896.1
D2412	Manufacture of fertilizers and nitrogen	197	132	281.2	640.9	1127.4
D2413	Manufacture of plastics in primary forms and of synthetic rubber	164	137	290.5	666.5	652.5
D2421	Manufacture of pesticides and other agro-chemical products	26	26	1820.3	4720.4	4405.7
D2422	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	277	247	279.1	402.3	330.3
D2423	Manufacture of pharmaceuticals, medicinal chemicals and botanical products	257	228	214.4	495.8	574.4
D2424	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	403	388	285.5	434.4	408.5
D2429	Manufacture of other chemical products n.e.c.	390	353	150.9	333.9	374.4
D2430	Manufacture of man-made fibres	25	23	1891.5	4062.4	3752.9
D2511	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	104	69	884.2	3041.9	3113.8
D2519	Manufacture of other rubber products	263	239	164.8	596.4	488.4
D2520	Manufacture of plastic products	1917	1739	17.4	54.2	59.1
D2610	Manufacture of glass and glass products	357	332	234.8	997.1	1001.8
D2691	Manufacture of non-structural non-refractory	89	88	1413.3	3062.5	2837.8
D2692	Manufacture of refractory ceramic products	62	48	551.3	962.6	910.1
D2694	Manufacture of cement, lime and plaster	44	30	542.2	1641.5	1529.7
D2695	Manufacture of articles on concrete, cement and plaster	1267	838	30.6	198.9	261.6
D2699	Manufacture of other non-metallic mineral products n.e.c.	564	457	135.2	406.3	357.9
D2710	Manufacture of basic iron and steel	232	183	190.1	1199.1	1076.6
D2720	Manufacture of basic precious and non-ferrous metals	219	168	186.7	1406.0	1196.7
D2731	Casting of iron and steel	147	137	328.9	818.1	649.4
D2732	Casting of non-ferrous metals	114	104	317.8	1125.8	1317.6
D2811	Manufacture of structural metal products	2244	2133	17.5	38.7	52.3
D2812	Manufacture of tanks, reservoirs and containers of metal	170	165	127.4	169.8	176.0
D2813	Manufacture of steam generators, except central heating hot water boilers	65	60	644.1	2355.8	1781.8
D2891	Forging, pressing, stamping and roll-forming of metal; powder metallurgy	432	420	84.7	144.9	172.3

Table 3 (cont.)

ISIC-REV 3	Manufacturing Industry	ESTABL. #	ENTERP. #	HHI-OECD (VA)	HHI (VA)	HHI (SHIP.)
D2892	Treatment and coating of metals; general mechanical engineering on a fee or contract basis	3190	3148	23.1	62.8	90.5
D2893	Manufacture of cutlery, hand tools and general hardware	418	397	219.4	901.6	1035.7
D2899	Manufacture of other fabricated metal products n.e.c.	1164	1098	47.4	131.8	247.1
D2911	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	179	169	688.0	2467.9	2239.2
D2912	Manufacture of pumps, compressors, taps and valves	339	313	93.9	210.2	276.5
D2913	Manufacture of bearings, gears, gearing and driving elements	22	18	1771.4	3160.7	3274.2
D2915	Manufacture of lifting and handling equipment	520	500	85.8	143.9	187.1
D2919	Manufacture of other general purpose machinery	655	634	63.6	117.4	118.2
D2921	Manufacture of agricultural and forestry	353	345	339.0	678.6	725.4
D2922	Manufacture of machine-tools	1029	1011	46.0	85.9	112.9
D2924	Manufacture of machinery for mining, quarrying and construction	465	439	80.4	159.5	188.7
D2929	Manufacture of other special purpose machinery	885	862	81.4	202.6	258.2
D2930	Manufacture of domestic appliances n.e.c.	452	440	116.9	244.8	298.1
D3000	Manufacture of office, accounting and computing machinery	684	678	208.8	816.0	2020.6
D3110	Manufacture of electric motors, generators and transformers	203	188	312.7	955.3	824.0
D3120	Manufacture of electricity distribution and control apparatus	306	276	169.9	378.0	419.4
D3130	Manufacture of insulated wire and cable	98	89	505.1	1798.3	2117.0
D3140	Manufacture of accumulators, primary cells and battery batteries	29	29	1024.2	1191.1	1275.6
D3150	Manufacture of electric lamps and lighting equipment	1126	1103	90.8	210.1	210.4
D3190	Manufacture of other electrical equipment n.e.c.	333	321	206.2	462.0	533.2
D3210	Manufacture of electronic valves ant tubes and other electronic components	475	454	148.6	356.0	1259.0
D3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy	190	175	232.3	1069.0	2395.7
D3230	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods	63	63	1500.2	1560.9	1352.9
D3311	Manufacture of medical and surgical equipment and orthopaedic appliances	1480	1451	68.4	100.8	94.3
D3312	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment	820	799	117.8	231.8	228.0
D3410	Manufacture of motor vehicles	57	45	493.1	3146.1	2232.8
D3420	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	472	437	100.1	552.0	503.8
D3430	Manufacture of parts and accessories for motor vehicles and their engines	684	547	42.1	347.6	398.2
D3511	Building and repairing of ships	95	91	727.6	1356.0	1239.9
D3512	Building and repairing of pleasure and sporting boats	346	341	129.9	212.8	245.3

Table 3 (cont.)

ISIC-REV 3	Manufacturing Industry	ESTABL. #	ENTERP. #	HHI-OECD (VA)	HHI (VA)	HHI (SHIP.)
D3520	Manufacture of railway and tramway locomotives and rolling stock	43	39	749.2	2700.4	2830.0
D3530	Manufacture of aircraft and space craft	460	410	187.7	2065.8	2004.6
D3591	Manufacture of motorcycles	88	88	1228.1	5534.9	6150.7
D3610	Manufacture of furniture	3502	3413	24.9	76.0	124.1
D3691	Manufacture of jewellery and related articles	454	453	458.8	1482.7	961.3
D3693	Manufacture of sports goods	373	361	136.6	298.2	362.2
D3694	Manufacture of games and toys	151	151	1091.4	4934.8	3991.8
D3699	Other manufacturing n.e.c.	1021	1009	69.2	107.8	95.1
	TOTAL	54,031	50,181			
	Mean	509.7	473.4	394.4	1147.2	1140.9
	Median	291.5	244.5	191.4	548.1	523.5
	Maximum	4162	3889	2368.2	6651.3	6274.8
	Minimum	10	8	17.4	38.7	45.2
	Std. Dev.	712.8	681.4	492.1	1368.7	1308.2
	n	106	106	106	106	106

Note:

1. OECD uses establishments in calculation of HHI, while Statistics Canada uses enterprises.

2. HHI based on value-added.

Source:

Statistics Canada

Figure 1.a) Hirschman-Herfindahl indices based on NAICS for Canada, 2001

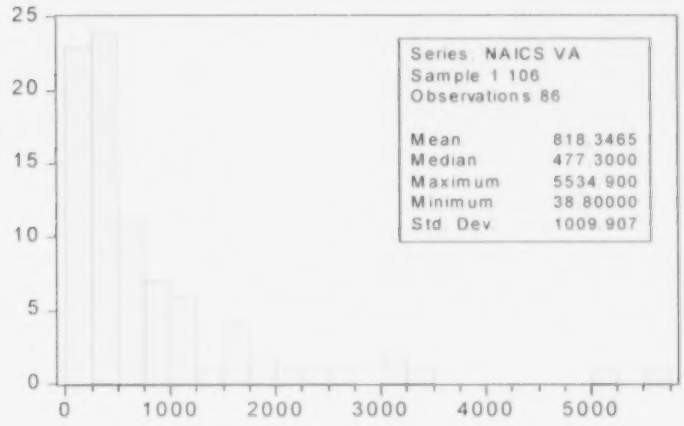
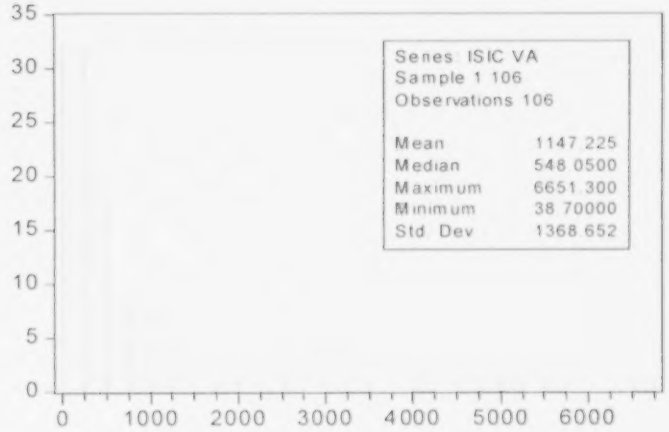


Figure 1.b) Hirschman Herfindahl indices based on ISIC for Canada, 2001



Note:
Numbers based on value added, at the 4-digit level for the manufacturing industry.

Source:
Authors' calculations based on Statistics Canada data.